Space Weather Technical Forecast

Issued on Sunday, 03 March 2024 at 13:27 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: Chance of isolated M-Class flares and Active geomagnetic intervals day 1 (03 Mar).

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Activity has been Low through the last 24 hours with a peak C6.6 flare from AR3595 in the northwest quadrant. There are eight sunspot regions on the visible disc, six of which are numbered, with two new, small, unnumbered groups now evident in the southwest and north-centre disc. Two moderately large, complex regions (AR3595 and AR3598) in the western hemisphere both underwent slight simplification and decay during the period. The remaining regions are smaller and appear mostly stable. Ex-AR3590 has rotated over the northwest limb, but magnetic looping is still visible above the solar limb. No Earth-directed CMEs were detected.

Solar Wind / Geomagnetic Activity: Solar winds observed at L1 by ACE were largely representative of a background solar wind environment, with winds below 300km/s. However, solar wind parameters became enhanced due to CME activity from around 03/0845 UTC. Speeds increased to peak at 375km/s, but have since eased to around 340km/s. Density was generally below average, but increased to above average following the CME arrival, peaking at 38ppcc at 03/1142 UTC. Total magnetic field strength, IMF, was generally weak, below 5nT, but peaked at 19nT (strong) at 03/1108 UTC. The north-south component, Bz was mostly weakly negative, but strengthened with the CME arrival, varying between +13/-16nT. Phi angle was predominantly negative (towards the Sun). Geomagnetic activity was largely Quiet, but with Unsettled (Kp3) intervals (03/0000-0300 UTC and 03/0900-1200 UTC).

Energetic Particles / Solar Radiation: GOES18 high energy (greater than 10MeV) proton flux was at background levels. High energy electron flux (greater than 2MeV) observed at GOES16 was also at background levels with the associated 24 hour fluence well below the Active (1e8 integrated pfu) threshold. The observed 24-hour fluence at 03/0000UTC was 3.5e6 integrated pfu.

Four-Day Space Weather Forecast Summary

Solar Activity: Low activity is expected, with a chance of isolated M-class flares, this risk likely decreasing between days 1 and 2 (03 and 04 Mar) in the absence of any further sunspot development.

Solar Wind / Geomagnetic Activity: Ongoing effects from one or more CMEs that arrived earlier on day 1 (03 Mar) should diminish by early day 2 (04 Mar) with no further CMEs in the current forecast. Otherwise Earth is expected to remain in a background solar wind environment with no significant coronal hole high speed streams expected. Unsettled to Active Geomagnetic activity at first, with a very slight chance of a G1/Minor Storm interval from lingering CME effects. Then easing to become Quiet from day 2 (04 Mar) onwards.

Energetic Particles / Solar Radiation: GOES18 high energy proton flux is likely to stay at background levels, but with a slight chance of rising above S1 levels in response to any notable flares, mainly from ex-AR3590 as this region rotates further beyond the northwestern limb.

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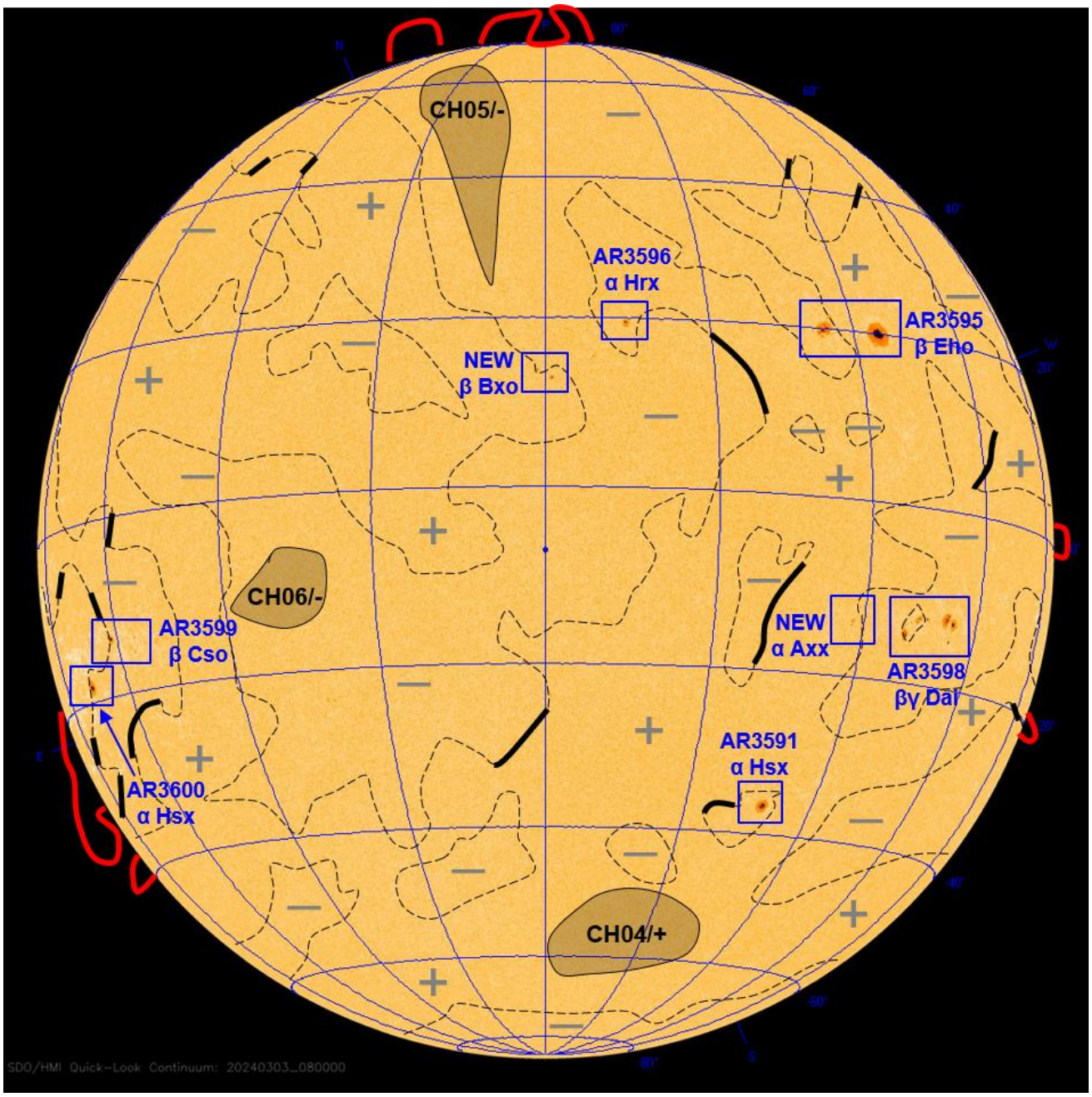
GOES16 high energy electron flux is expected to remain at background, occasionally moderate levels with the associated 24hr fluence remaining well below the Active threshold throughout.

Figure 1. Solar Analysis Valid 03/0800 UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

Ongoing effects from one or more CMEs that arrived at Earth early on 03 Mar should steadily diminish on day 1. No further CMEs currently feature in the forecast.

Despite the recent CME arrival, slow-ambient solar wind speeds are still being observed at L1 and are expected to remain at background levels with no significant enhancements anticipated during the period.

Unsettled to Active Geomagnetic activity at first, with a very slight chance of a G1/Minor Storm interval from lingering CME effects. Then easing to become Quiet from day 2 (04 Mar) onwards.

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	10	1	1	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections- Nil

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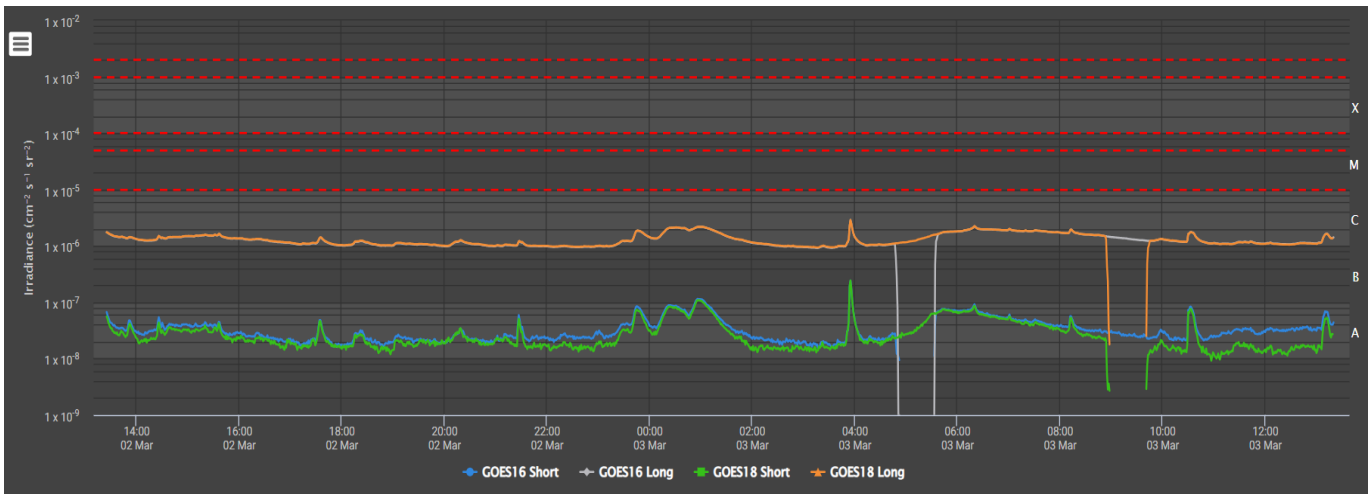
Radio Blackouts - X-Ray Flares:

There are currently eight sunspots on the visible disc, six of these are numbered. Solar activity has been Low with a peak C6.6 flare from AR3595, a moderately large region in the northwest quadrant. AR3598 is the most complex sunspot on the disc as a bipolar group with a number of intermediate spots, however the potential delta region occupying the intermediate portion of the group has shown signs of decay in recent hours. The sunspot does still maintain a Beta-Gamma Mount Wilson magnetic configuration, indicating elevated magnetic complexity. Ex-AR3590 rotated off the northwest limb during the past 24 hours, but could potentially produce flares which could be visible at Earth from beyond the limb through the next 12-24 hours. The remaining regions on the disc are currently simpler and smaller.

Low activity is expected, with a chance of isolated M-class flares, this risk likely decreasing between days 1 and 2 (03 and 04 Mar) in the absence of any further sunspot development.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	50	30	30	30
Very Active	R3 to R5 X Class	No	5	1	1	1

Figure 2: Latest GOES16/18 X-Ray flux



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Solar Radiation Storms - (High Energy Protons):

GOES-18 proton flux is currently at background levels, and is likely to remain so through the period. There is a slight chance of enhancement from any major flare associated with ex-AR3590 from the far side of the northwest limb, with this risk decreasing through the next 36 hours.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	15	10	5	5
Very Active	**≥ S3 ***	No	5	3	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

High Energy Electrons Event (≥ 2MeV):

High energy electron flux (greater than 2MeV) is expected to remain at background, occasionally moderate levels in the absence of any significant solar wind inputs.

Corresponding high energy electron fluence is expected to remain well below the Active threshold (1e8 integrated pfu).

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	1	1	1	1
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

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Figure 3: GOES16 >2MeV Electron flux (above) and MOSWOC REFM with recurrence (below)

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